RFL Communications plc

RFL-SHFI-M Module

C37.94 Short Haul Fibre Interface For Milegate

User Manual

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1. Introduction

The RFL C37.94 Module Short Haul Fibre Interface (Part No. RFL-SHFI-M) provides an optical interface compliant with IEEE C37.94 "IEE Standard for N Times 64 Kilobit Per Second Optical Fibre Interfaces between Teleprotection and Multiplexer Equipment". The module is a double extended eurocard designed as a 'blade' to integrate into a Keymile Milegate chassis.

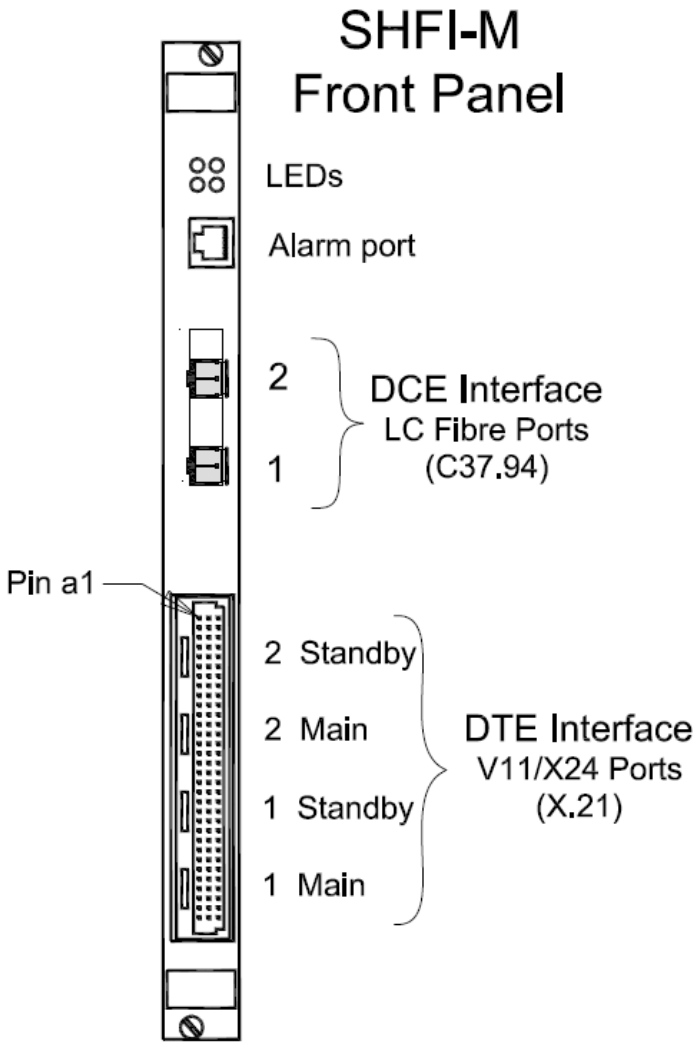
The RFL-SHFI-M module provides two IEEE C37.94 channels. For each channel, both Main and Standby V11 interfaces are provided to support redundant configuration of communication paths. Each channel on the RFL-SHFI may be configured to operate with a single (main) path between Milegate nodes, or with dual (main and standby) paths.

- The SHFI-M module is equipped with two SFP cages; SFP transceivers with duplex multimode LC ports are fitted as required for the application.

The RFL-SHFI-M module has to be interfaced to an appropriate V11/X24 interface, e.g.:

- A TUDA card card in the same chassis.
- A 3rd party V11/X24 interface (e.g. BT NTU).

2. Front panel



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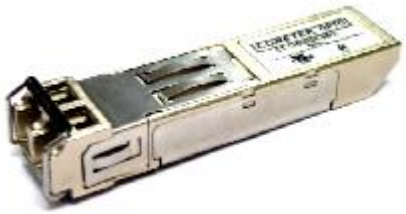
3. Optical Interface

Note: Fibre optic transceivers fitted to SHFI-M modules are compatible with the standards for Class 1 laser products

Each channel is equipped with one SFP (small form pluggable) cages, to accept a suitable multimode 1000Base-SX SFP transceiver. The SFP transceivers are equipped with duplex LC connectors (62.5/125 µm or 50/125 µm fibre), and as with the SHFI, the connectors are angled down to allow the fibre patchleads to be accommodated behind the Milegate front cover. It is not necessary to fit a transceiver to a channel that is not in use.

Any transceiver used with the SHFI-M has to be suitable for the low data rates that are utilised. RFL supply a specific SFP (part no. CT-0155NSP) which has been tested and proved to be suitable over the data rate ranges encountered; other SFPs may also be suitable but have not been tested.



C37.94 Compliant SFP

Refer to Section 11 for optical data.

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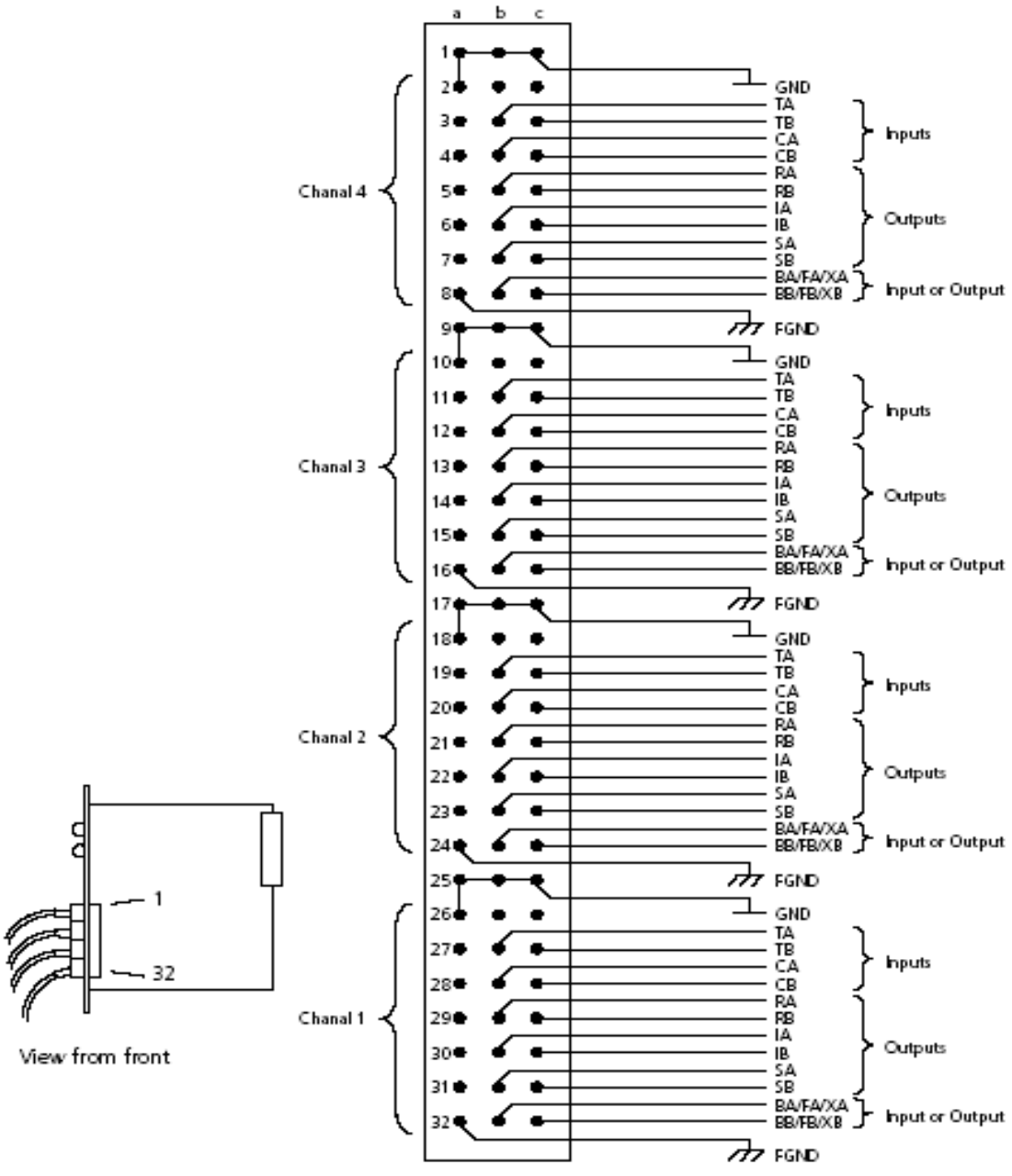
4. Digital Interface

The V11 / X24 ports on the RFL C37.94 SHFI-M module are identical to the ports on the Keymile TUDA card DTE V11 / X24 (channels 1 – 4).

Pin assignments on the RFL SHFI-M and the TUDA 36 pin connector as follows:



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Pin assignments on the RFL-SHFI-M module are as detailed in the following table:

2 standby	2 main	1 standby	1 main	
Pins 2a	10a	18a	26a	Signal Ground
Pins 8a	16a	24a	32a	Frame Ground
Pins 2b, 2c	10b, 10c	18b, 18c	26b, 26c	Not used
Pins 3a to 7a	11a to 15a	19a to 23a	27a to 31a	Not used
Pins 3b, 3c	11b, 11c	19b, 19c	27b, 27c	TA and TB respectively
Pins 4b, 4c	12b, 12c	20b, 20c	28b, 28c	CA and CB respectively
Pins 5b, 5c	13b, 13c	21b, 21c	29b, 29c	RA and RB respectively
Pins 6b, 6c	14b, 14c	22b, 22c	30b, 30c	IA and IB respectively
Pins 7b, 7c	15b, 15c	23b, 23c	31b, 31c	SA and SB respectively
Pins 8b, 8c	16b, 16c	24b, 24c	32b, 32c	BA and BB respectively

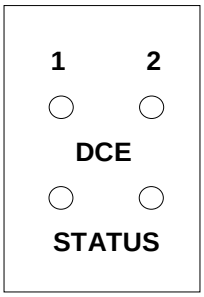
Pins 1a, 1b, 1c, 9a, 9c, 9c, 17a, 17b, 17c, 25a, 25b, 25c Ground. Note: mating C/4 connectors do not make contact with these pins.

Manufactured cable assemblies are available as follows:

- RFL Cable Assembly 05-0805-51 Single ended lead; specify length.
- RFL Cable Assembly 05-0805-52 Generic cross-connect lead with SHFI connector at one end and D15 male plug at the other end, for connecting any C37.94 port to an appropriate standard X.21 15 pin 'D' connector; specify length.
- RFL cable assembly 05-0805-53 UMUX Cross-connect lead; 700mm long overall with connector at each end for linking any C37.94 port to the appropriate port an adjacent TUDA card.

5. LEDs

LED indicators are providing an indication of channel status and to assist with commissioning and fault-finding.
The LEDs are laid out in the following arrangement. The left hand column relates to channel 1; the right hand column relates to channel 2.



The following definitions are used in the LED Definition Table:

Main clock healthy	The clock signal from the DCE (TUDA X24/V.11) for the main path is present and phase locked (a path may be temporarily out of phase lock when switching between main and standby).
Standby clock healthy	The clock signal from the DCE (TUDA X24/V.11) for the main path is present and phase locked.
Main path healthy	The main path between Milegate nodes is present and healthy.
Standby path healthy	The standby path between Milegate nodes is present and healthy

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Sync	The channel is said to be in sync if the DTE is visible (i.e. the SHFI-M is receiving data from the DTE on the C37.94 optical port although the data rate need not be correct).
Yellow alarm	Remote alarm. The equipment at the opposite end of the link is out of sync (i.e. transmitting but not receiving). For the SHFI-M this relates to equipment on the local C37.94 fibre link only.
Flashing fast	2 flashes in 1s
Flashing slowly	1 flash in 2s

LED Definition Table

Note: If a channel is not in use, setting that channel to 'disabled' (see Switch Settings Table) will force both LEDs for that channel to 'off'. This table is therefore applicable to enabled paths only.

Channel 1 LED Indicators			
LED status		**Main path only enabled**	**Main and standby path enabled**
Channel 1 DCE	Off	Hardware fault on RFL-SHFI-M	
	Green steady = Healthy	Main clock healthy and Main path healthy	Main and standby clocks healthy, and Main and standby paths healthy
	Green flashing slowly = Warning	Not applicable	Either main or standby clock missing or Either main or standby path missing
	Green flashing fast = Alarm	Main clock missing, or Main path missing, or Milegate config error	Both main and standby clocks missing, or Both main and standby paths missing, or Milegate config error
Channel 1 Status (in order of precedence)	Off	DTE out of sync	
	Green steady = Healthy	In sync Correct data rate configuration. Main path is in use	
	Green flashing slowly = Information	Not applicable	In sync and correct data rate configuration. Comms has switched to standby path
	Green flashing fast = Alarm	In sync Incorrect data rate configuration (see switch settings)	
	Yellow steady = Remote alarm	Yellow Alarm	
Channel 2 LED Indicators			
Channel 2 DCE	As channel 1	As channel 1	
Channel 2 Status	As channel 1	As channel 1	

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Channel Healthy Status:
For an enabled channel (with or without standby path), the following state = completely healthy:

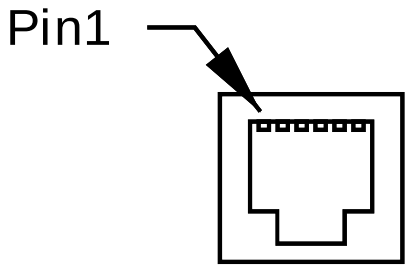
DCE LED	Solid Green
Status LED	Solid Green

Channel Operational but with warnings status:
For an enabled channel with standby, the following states = the channel operational with warnings:

DCE LED	Slow Flash Green	Either Main or Standby Clock has been lost
Status LED	Slow Flash Green	Comms has switched to Standby Path

6. Alarm output

One voltage free changeover contact is presented on an RJ11 jack.



Pin 1	Common	
Pin 2	Normally Closed	(closed = no alarm)
Pin 3	Normally Open	(closed = alarm)
Pins 4 to 6	Not used	

The alarm relay will operate if any alarm is displayed on the RFL-SHFI-M module (see section 5). In summary the alarm relay operates when any of the following events occur on an enabled channel:

1. One or both clocks missing on V11 DCE interface.
2. Receiving Yellow Alarm (i.e. alarm from remote end of DTE link)
3. Receive fibre out of sync with DTE equipment
4. Mismatch in data rate setting (Number of Time slots used) between local and remote, or between DCE and RFL-SHFI-M module.

Ensure unused channels are set to ‘disabled’ (see Switch settings); this will inhibit alarm operation for that channel.

Note that the alarm contact will close during boot-up and synchronisation. This could be up to 5 minutes.

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7. Switch settings

Two 8 way Dip switches configure the functions for each channel.
Switch 1 configures channel 1; Switch 4 configures channel 2.

Switch Settings Table		
Switch 1	**Switch 4**	**Function**
Ch 1	**Ch 2**	
1 – 1	4 – 1	0000 = channel disabled (use this setting if port not used) 0001 to 1100, channel data rate, multiple of 64kbits/sec, Coded in binary, switch 1 is LSB. (e.g. for n = 1, set switch 1 to On and switches 2 – 4 to Off)
1 – 2	4 – 2	
1 – 3	4 – 3	
1 – 4	4 – 4	
1 – 5	4 – 5	Standby path switch: On = Main and standby path enabled (V11 port can fall back to Standby) Off = Main path only enabled; standby path not enabled (Main V11 port only in use)
1 – 6	4 – 6	On = Local Loop on fibre port
1 – 7	4 – 7	On = Disable fibre port when received signal data is low
		Off = Do not disable fibre port when received signal level is low
1 – 8	4 – 8	Test mode switch: On = not used Off = normal operation

8. Standby Operation

When a channel is not enabled for standby operation, only a single communication path is required from end to end. Only the main port for that channel is to be interconnected between the RFL-SHFI-M module and the TUDA card.

When a channel is enabled for standby operation two parallel communication paths are required from end to end, and both the main and standby ports are to be interconnected between the RFL-SHFI-M module and the TUDA card.

Operation of standby function. (Standby path enabled). When both main and standby paths are available, comms are always transmitted across the main path. Should the main path become unavailable comms is immediately switched to the standby path. When the main path is restored to operation for a period in excess of approx. 15 seconds, comms reverts to the main path.
The switch time (i.e. the period for which there is no valid comms end to end) is less than 50ms in either direction.

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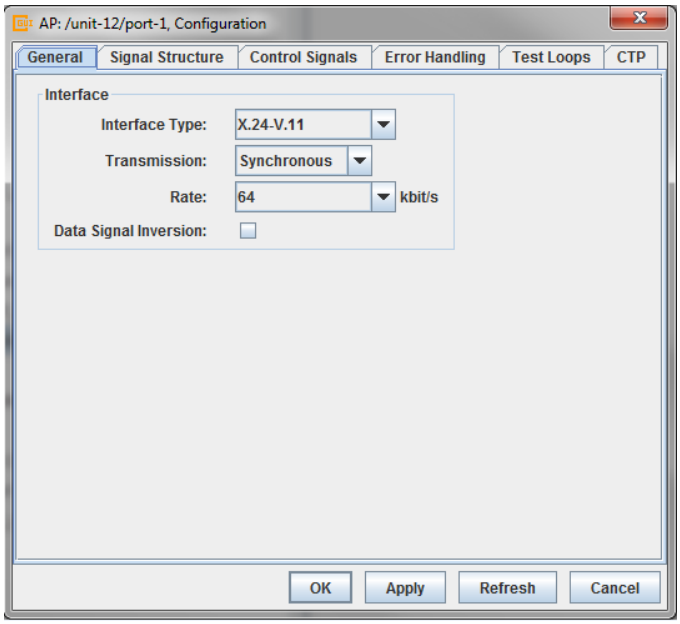
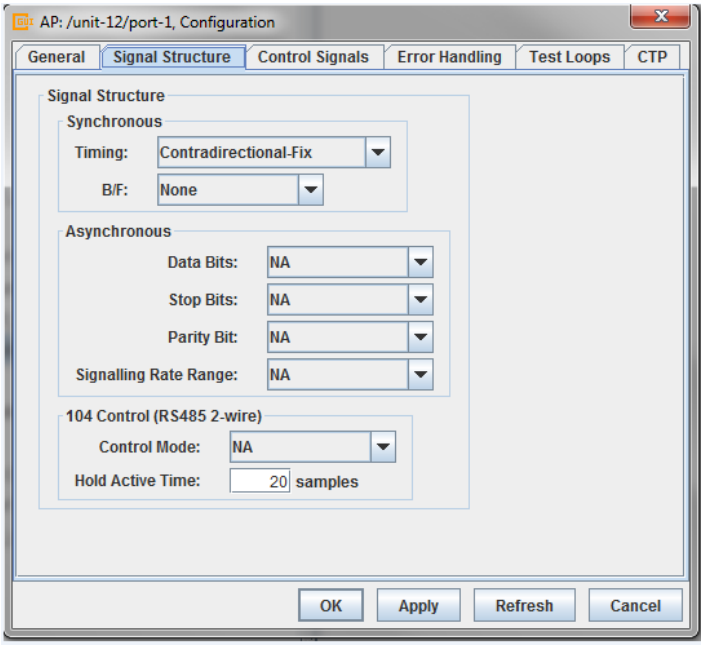
9. Milegate channel configuration (TUDA)

This configuration applies to each channel that is interconnected to the RFL-SHFI-M module.

1. General Settings:



2. Signal Structure can be left as per default, as below:



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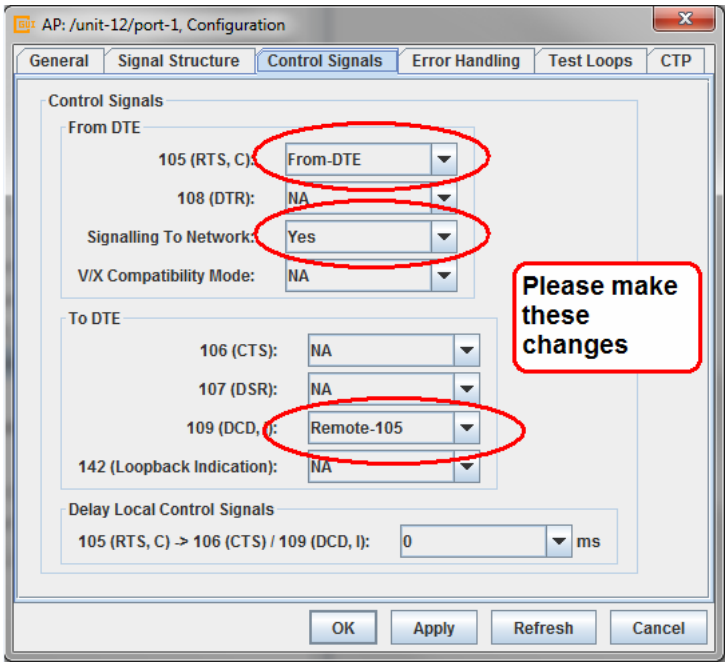
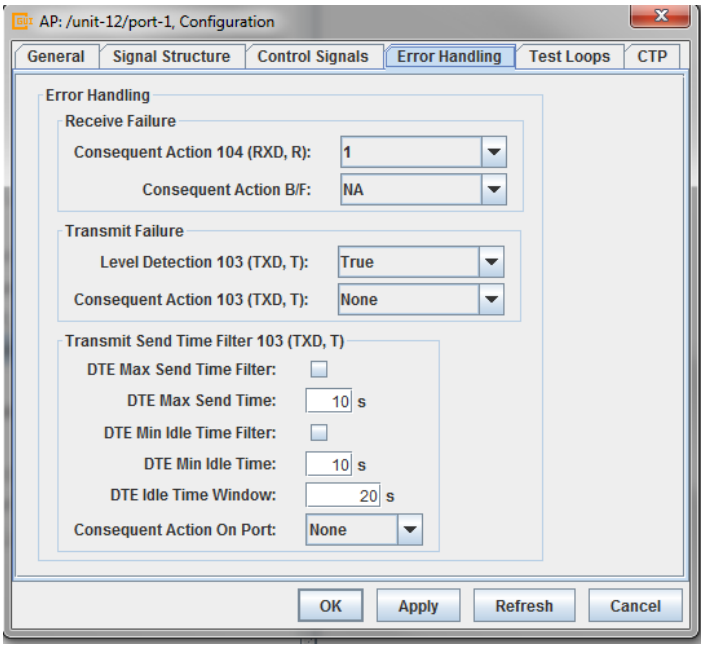
3. Details – Control Signals



4. Details – Error Handling



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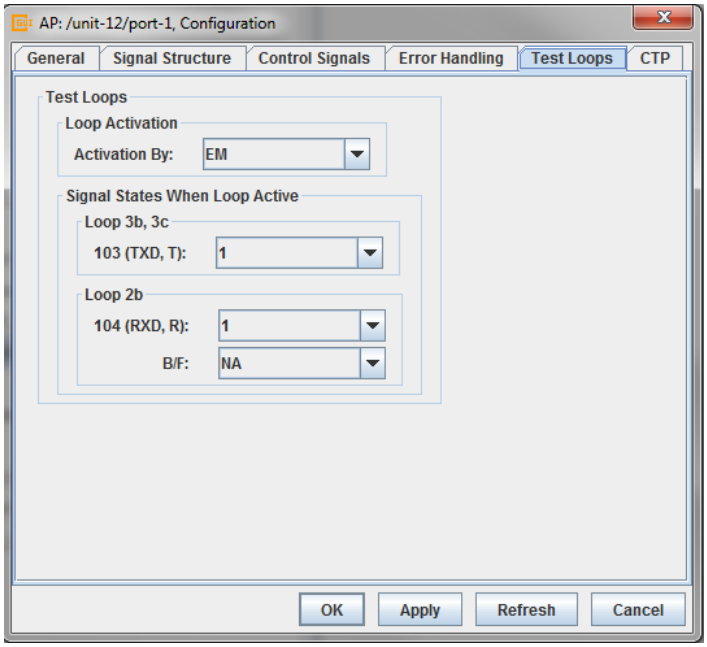
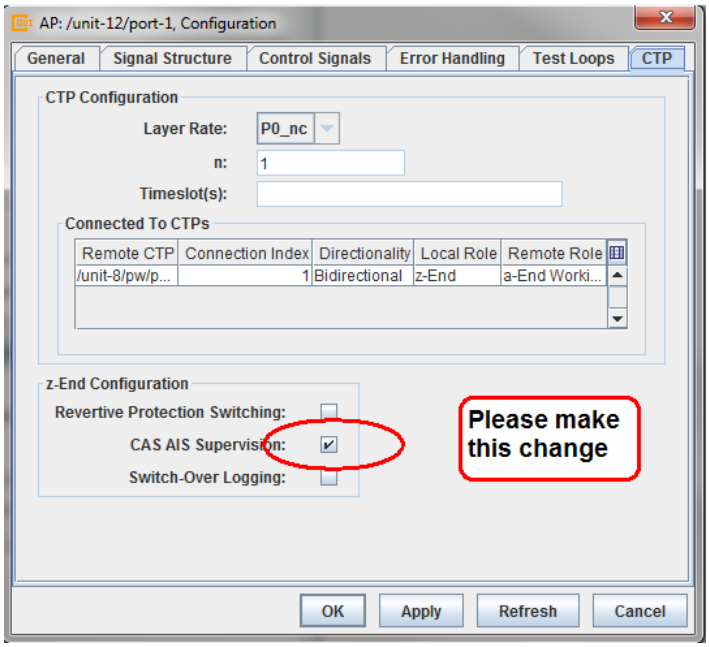
5. Details – Test Loops



6. Details – CTP



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10. Specification

10.1 Electrical Data

- RFL-SHFI-M module load at 48Vdc (dual channel operation) = 53mA; 2.54W
- When configured standalone in a Milegate rack + FANU6
  Load at 48Vdc (dual channel operation) = 200mA (9.6W)

10.2 Optical Data

Typical optical data is detailed in the following table. Values are based on the on SFP type CT-0155NSP (C37.94 compliant).

Optical Data		
		SHFI-M
Peak optical power output (min / max)		
Average optical power output (min / max)		-19dBm / -11dBm
Optical sensitivity		-32dBm
Recommended max transmission distances	Using 62.5/125µm	300m
	Using 50/125µm	550m

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